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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
FLETCHER III, WILLIAM P	
ART UNIT	PAPER NUMBER
1762	8

DATE MAILED: 10/30/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

AS-8

Office Action Summary	Application No.	Applicant(s)	
	09/739,087	SHAIKH ET AL.	
	Examiner	Art Unit	
	William P. Fletcher III	1762	

The MAILING DATE of this communication appears on the cover sh et with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 August 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,6,7,9 and 20-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6,7,9 and 20-23* is/are rejected.

7)☒ Claim(s) *1 and 9* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☒ The proposed drawing correction filed on *07 August 2002* is: a)☒ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED OFFICE ACTION

I. Receipt of Response

Receipt is acknowledged of applicant's response filed 07 August 2002, made of record in this file as Paper No. 6.

Receipt is further acknowledged of applicant's proposed drawing correction filed 07 August 2002, made of record in this file as Paper No. 7.

II. Response to Amendment

Applicant's amendment in Paper No. 6 has amended the title, specification, and claims 1, 6, and 7, cancelled claims 5 and 8, and added new claims 20 – 23. The amendment introduces new matter. See below for details.

III. Response to Arguments

Applicant's arguments presented in Paper No. 6 have been fully considered, but they are not persuasive.

1. Applicant has argued:

> ...Alkhimov, et al. discloses a gas dynamic spraying method which utilizes a spray gun that in most situations is unacceptable for utilization in Applicant's environment. More specifically, the spray gun of Alkhimov is too large to place within a cylinder of an automotive internal combustion engine, the main environment of Applicant's invention.... Therefore, one knowledgeable in the art of Palazzolo, et al. would not think to use the Alkhimov et al. spray gun due to its inability to spray inside a cylinder.

In response, the examiner notes that this argument is unsupported by any evidence of record. The arguments of counsel cannot take the place of evidence in the record [MPEP § 716.01(c)]. Specifically, there is no evidence in the record remotely indicating that the spray gun of Alkhimov et al. is too large to place within a cylinder of an automotive internal combustion engine. In fact, Alkhimov et al. provide no empirical dimensions whatsoever for their apparatus. Consequently, this argument is not persuasive.

2. Applicant has argued:

> The above incompatibility of using the Alkhimov spray gun to spray a cylinder bore is further buttressed by a reading of Alkhimov, column 10, lines 16 – 21. As shown in Figure 1, the length of the supersonic portion of the nozzle has to be at least 25 – 100 times the width of the nozzle shown in Figure 3, along lines b. Accordingly, one familiar with Palazzolo would not think to use Alkhimov et al. to practice applicant's inventive method.

In response, the examiner notes that this argument does not support applicant's position set-forth above. The ratio cited is one of relative length and provides no evidence that the spray gun of Alkhimov et al. is too large to place within a cylinder of an automotive internal combustion engine. Consequently, this argument is not persuasive.

3. Applicant has argued:

> The addition of Shepard to the combination of Palazzolo and Alkhimov would not be made since Shepard is primarily teaching methods of liquid metal spraying, methods that Applicants are trying to get away from.

In response, the examiner notes that all of applicant's arguments are directed to claim 1, either as originally-presented or as amended in Paper No. 6. Shepard was not cited to reject claim 1 as originally-filed. Shepard has been cited, in combination with Palazzolo et al. and Alkhimov et al., to reject claim 1 as amended. In the rejection of amended claim 1 below, Shepard has been cited to show to spraying the inside of a cylinder bore with a coating material utilizing a nozzle having up and down relative movement with the engine block and being at an angle of 30° ± 15° with a surface of the cylinder bore. Since Shepard is directed to the spray-application of coating materials to the inside surfaces of cylinder bores, it is the examiner's position that one of ordinary skill in the art would have looked to Shepard for guidance as to the relative positioning and movement of the nozzle and the cylinder bore — regardless of whether the method of application is gas-dynamic cold spraying or wire-fed metallization.

4. Applicant has argued:

> Additionally, Shepard would lead Applicants away from their invention. Shepard, in column 6, lines 63 – 67, teaches rotating the cylinder about its center during the application of the lining material molybdenum. This teaching is contrary to Applicant's invention for the following two reasons: one, rotating the cylinder would be disadvantageous on an internal combustion engine since each cylinder would have to be lined individually. Two, more importantly, Applicant's deliberately lined the cylinders in up and down relative movement so that there is no formation of horizontal fissures or cracks in the layer material. Horizontal fissures and cracks in such a lining could create places where lubricant oil could collect away from the lining surface. Therefore, the up and down relative movement between the nozzle and the engine block inhibits any horizontal cracks in the lining.

In response, applicant's first point is not convincing and, further, is not commensurate in scope with the claim. The first point is not convincing because the cylinder bore is still coated in the manner recited in the claim. The first point is not commensurate in scope with the claim because the language of the claim does not preclude rotating the cylinder while coating. Although the claims are interpreted in light of the

specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

With respect to applicant's second point, careful review of c. 6, ll. 63 – 67 reveals that Shepard teaches rotating the cylinder while advancing the nozzle co-axially. Applicant's spray pattern is illustrated in Fig. 6 of the specification: one spray pass is performed, followed longitudinal advancement of the nozzle, then another spray pass, etc. This appears, to the examiner, to be identical to the rotation/co-axial advance of the nozzle taught by Shepard. Unless critical method step(s) are not recited, it is the examiner's position that the method of Shepard does not form cracks or fissures in the layer material. Additionally, the examiner notes that this argument is further not convincing because the feature upon which applicant relies (i.e., prevention of cracks or fissures in the layer material) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

5. Applicant has argued:

> In relation to claim 3, it should be noted that Shepard teaches a first lining material of molybdenum, which is significantly harder than stainless steel, and accordingly would lead one knowledgeable with the above-cited reference in a manner away from Applicant's invention as defined by claim 3.

In response, while Shepard may teach one embodiment utilizing molybdenum, the reference still teaches that where a particular wear- and corrosion-resistance are desired, stainless steel may be the second lining material [c. 5, ll. 23 – 27].

6. Applicant's arguments with respect to the newly-added claims are moot in view of the grounds of rejection set-forth below.

IV. Form & Content of Application

Title

Applicant has amended the title. The objection to the title under this section in Paper No. 5 is hereby withdrawn.

Specification

Applicant has amended the specification. The objections to the specification under this section in Paper No. 5 are hereby withdrawn.

Drawings

The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on 07 August 2002 have been approved. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

The Patent and Trademark Office no longer makes drawing changes. See 1017 O.G. 4. It is applicant's responsibility to ensure that the drawings are corrected. Corrections must be made in accordance with the instructions below.

Information on How to Effect Drawing Changes

1. Correction of Informalities -- 37 CFR 1.85

New corrected drawings must be filed with the changes incorporated therein. Identifying indicia, if provided, should include the title of the invention, inventor's name, and application number, or docket number (if any) if an application number has not been assigned to the application. If this information is provided, it must be placed on the front of each sheet and centered within the top margin. If corrected drawings are required in a Notice of Allowability (PTOL-37), the new drawings **MUST** be filed within the **THREE MONTH** shortened statutory period set for reply in the "Notice of Allowability." Extensions of time may NOT be obtained under the provisions of 37 CFR 1.136 for filing the corrected drawings after the mailing of a Notice of Allowability. The drawings should be filed as a separate paper with a transmittal letter addressed to the Official Draftsperson.

2. Corrections other than Informalities Noted by Draftsperson on form PTO-948.

All changes to the drawings, other than informalities noted by the Draftsperson, **MUST** be made in the same manner as above except that, normally, a highlighted (preferably red ink) sketch of the changes to be incorporated into the new drawings **MUST** be approved by the examiner before the application will be allowed. No changes will be permitted to be made, other than correction of informalities, unless the examiner has approved the proposed changes.

3. Timing of Corrections

Applicant is required to submit acceptable corrected drawings within the time period set in the Office action. See 37 CFR 1.185(a). Failure to take corrective action within the set (or extended) period will result in **ABANDONMENT** of the application.

Claims

Claim 1 is objected to. Correction of the following minor informality is required: "...at an angle at 30°..." should, apparently, read "...at an angle of 30°...".

Claim 9 is objected to as depending from a cancelled claim. For the purpose of examining the claims on their merits, the examiner has interpreted claim 9 as depending from claim 1.

V. Rejections under 35 U.S.C. § 112, 1st Paragraph

The following is a quotation of the first paragraph of 35 U.S.C. § 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

> **Claims 20, 21, and 23** are rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The subject matter of these claims is directed to an embodiment in which the cylinder bore is coated with a graded layer of material. After careful review of the originally-filed disclosure, the examiner has identified p. 13, ll. 16 – 24, of the specification as disclosing this embodiment:

> To enhance coating effectiveness as a continuous coherent and well-bonded, wear-resistant coating, the particles of copper and wear liner material may be blended as a transient gradient between the thermal management layer of copper and the wear resistant layer of wear resistant material. If the wear resistant material is tool steel, smaller steel particles (less than 5 microns) net more readily with the larger copper particles (10 – 45 microns) to avoid any possible inter-splat boundaries to enhance the integrity of the coating.

Claim 20 recites coating "a first material" and "a second material." The passage above supports only copper as a first material and a wear resistant material as a second material. The originally-filed disclosure does not support any and all materials in this embodiment. Possession of a species does not, necessarily, indicate possession of a genus.

VI. Rejections under 35 U.S.C. § 112, 2nd Paragraph

The following is a quotation of the second paragraph of 35 U.S.C. § 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

> **Claims 20 – 23** are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With respect to claims 20, 21, and 23, the term "transient gradient" renders these claims indefinite. The examiner has interpreted the adjective "transient" as meaning "passing especially quickly into and out of existence" [*Merriam-Webster's Collegiate Dictionary, 10th Ed.*, p. 1254]. Based on this definition, it is unclear whether the gradient exists at all. From applicant's disclosure as a whole, the examiner has understood the gradient as being real, concrete, and enduring. Consequently, the modifier "transient" is confusing and contradictory, in addition to being indefinite.

Additionally, claim 20 recites the term "a second material" twice. It is unclear whether each instance of this term refers to the same or different materials. From applicant's disclosure as a whole, and for the purpose of examining the claims on their merits, the examiner has interpreted the two instances of "a second material" to be referring to the same material, as in: "...a second material, and then coating said bore with the second material."

With respect to claim 22, this claim recites the limitations "said first material" and "said second material." There is insufficient antecedent basis for these limitations in the claim.

Claim 22 is further unclear as to which materials are being utilized since the specification discloses a size range of 10 – 22 microns for particles of copper or copper alloy, and a range of 1 – 50 microns for particles of the wear-resistant material.

VII. Rejections under 35 U.S.C. § 103

The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

> The rejections of **claims of 1 – 4, 6, 7, and 9**, under this section in Paper No. 5 are hereby withdrawn. The rejections of **claims 5 and 8** under this section in Paper No. 5 are moot in view of applicant's cancellation of these claims.

> **Claims 1 – 4, 6, 7, 9, and 22**, are rejected under 35 U.S.C. § 103(a) as being unpatentable over Palazzolo et al. {US 5,691,004}, in view of Alkhimov et al. {US 5,302,414}, in view of Shepard {US 2,588,422}.

With respect to claims 1, 6, 7, and 9, Palazzolo et al. teach a process of lining a cylinder bore of an aluminum engine block in which the cylinder bore is sprayed with a lining material of various metals that are different from the material of the engine block [abstract]. The lining material is applied by thermal spraying [abstract]. This thermal spraying is carried-out by a powder plasma spray technique [c. 4, ll. 55 – 56].

Palazzolo et al. do not teach that the lining material is applied using a gas-dynamic cold spray, that the spray comes from a nozzle having up and down relative movement with said engine block, or that the nozzle is at an angle of 30° plus or minus 15° with a surface of said cylinder.

Alkhimov et al. teach a cold gas-dynamic spraying process for applying a coating to an article [abstract]. This process directs a jet of powder of a metal, alloy, or a mechanical mixture of a metal and an alloy, against an article to deposit the coating [abstract].

Alkhimov et al. teach that their cold gas-dynamic spraying process eliminates damage to the substrate and poor coating characteristics associated with powder plasma thermal spraying techniques [c. 1, l. 44 – c. 4, l. 5].

Because both Palazzolo et al. and Alkhimov et al. teach the spray application of powders of metals and/or alloys to substrates, and because Alkhimov et al. teach that their cold gas-dynamic spraying process is superior to powder plasma thermal spraying, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the process of Palazzolo et al. so as to deposit the lining material by the cold gas-dynamic spraying technique of Alkhimov et al. One of ordinary skill in the art would have been motivated by the expectation of successfully depositing the lining material of superior quality without damaging the cylinder bore.

Shepard teaches a process similar to that of Palazzolo et al. in which a lining material is applied to an aluminum cylinder bore by thermal spraying [c. 6, Example]. The spray nozzle is advanced co-axially

into the cylinder, and the nozzle sprays at an angle of approximately 40° with respect to a surface of the cylinder bore [c. 6, Example]. The desired thickness may be applied in more than one pass [c. 6, Example].

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the process of Palazzolo et al. in view of Alkhimov et al. so as to apply the lining material according to the process of Shepard described above. One of ordinary skill in the art would have been motivated by the expectation of successfully coating the cylinder with the lining material.

The nozzle angle of 40° taught by Shepard falls within the claimed range of 30° ± 15°. It is the examiner's position that advancing the nozzle co-axially into the cylinder reads on "having up and down relative movement with said engine block." Further, it is the examiner's position that Shepard's teaching of co-axially positioning the nozzle reads on "positioned along a longitudinal center axis of said cylinder." Finally, it is the examiner's position that modifications necessary to the apparatus of Alkhimov et al., such as those required to angle the nozzle to spray at approximately 40°, would have been well-within the level of skill of one of ordinary skill in the art.

With respect to claim 2, Palazzolo et al., in view of Alkhimov et al., in view of Shepard, teach all the limitations described above. Palazzolo et al. further teach that their process coats the cylinder bore with a first and a second lining material [abstract]. The first lining material may be 95% bronze [c. 4, ll. 50 – 54]. Bronze is an alloy of copper. The second lining material ferritic stainless steel mixed with nickel-encapsulated boron nitride [c. 5, ll. 8 – 15].

Palazzolo et al. do not explicitly state that the second material has a heat transfer resistance that is greater than the first material.

Shepard teach a process similar to that of Palazzolo et al. in which a first and second lining material are thermal spray-applied to an aluminum cylinder bore [c. 6, Example]. More specifically, they teach that where a particular wear- and corrosion-resistance are desired, stainless steel may be the second lining material [c. 5, ll. 23 – 27].

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the process of Palazzolo et al., in view of Alkhimov et al., in view of Shepard, so as to apply, as the second lining material, stainless steel. One of ordinary skill in the art would have been motivated to do so by the expectation of successfully depositing a wear- and corrosion-resistant lining material.

Applicant, at p. 6, l. 14 – p. 7, l. 15 of the specification, disclose that a suitable combination of first and second material layers, in which the second material layer has a higher heat transfer resistance than the first material layer, is a copper alloy as the first material layer and stainless steel as the second material layer. Therefore, it is the examiner's position that Palazzolo et al., in view of Alkhimov et al., in view of Shepard, teach coating the cylinder bore with two material layers, with the heat transfer resistance of the second material layer being greater than that of the first material layer.

With respect to claim 3, Palazzolo et al., in view of Alkhimov et al., in view of Shepard, teach all of the limitations of this claim described above. Palazzolo et al. further teach that their process coats the cylinder bore with a first and a second lining material [abstract]. The first lining material may be 95% bronze [c. 4, ll. 50 – 54]. Bronze is an alloy of copper. The second lining material is ferritic stainless steel mixed with nickel-encapsulated boron nitride [c. 5, ll. 8 – 15].

Palazzolo et al. do not explicitly state that the adhesion of the first material layer to the aluminum engine block is greater than that of the second material layer, or that the material hardness of the second material layer is greater than that of the first material layer.

Nevertheless, Palazzolo et al. teach that the first material layer is coated as a bond coat because of its metallurgical affinity for the substrate [c. 4, ll. 50 – 54]. It is the examiner's position that, in the process of Palazzolo et al., the first material layer inherently has a greater adhesion to the aluminum engine block as attested to by it's being used as a bond coat.

Further, bronze is a soft alloy, certainly softer than ferritic stainless steel mixed with nickel-encapsulated boron nitride. It is the examiner's position that Palazzolo et al. also, therefore, teach that the material hardness of the second lining material is greater than that of the first.

In the alternative, Shepard teach a process similar to that of Palazzolo et al. in which a first and second lining material are thermal spray-applied to an aluminum cylinder bore [c. 6, Example]. More specifically, they teach that where a particular wear- and corrosion-resistance are desired, stainless steel may be the second lining material [c. 5, ll. 23 – 27].

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the process of Palazzolo et al. in view of Alkhimov et al. so as to apply, as the second lining material, stainless steel. One of ordinary skill in the art would have been motivated to do so by the expectation of successfully depositing a wear- and corrosion-resistant lining material.

The applicants, on p. 6, l. 14 – p. 7, l. 15 of the specification, disclose that a suitable combination of first and second material layers, in which the first material layer has a greater adhesion to the aluminum engine block that the second material layer, and the second material layer has a greater material hardness than the first material layer, is a copper alloy as the first material layer and stainless steel as the second

material layer. Therefore, it is the examiner's position that Palazzolo et al. in view of Alkhimov et al., in further view of Shepard, teach coating the cylinder bore with two material layers, with the adhesion of the first material layer to the aluminum engine block greater than the second material layer, and the material hardness of the second material layer greater than the first material layer.

With respect to claim 4, Palazzolo et al., in view of Alkhimov et al., in view of Shepard, teach the limitations of this claim described above.

Palazzolo et al. do not explicitly state that the adhesion of the first material layer to the aluminum engine block is greater than that of the second material layer, or that the material hardness of the second material layer is greater than that of the first material layer.

The applicants, on p. 6, l. 14 – p. 7, l. 15 of the specification, disclose that a suitable combination of first and second material layers, in which the first material layer has a greater adhesion to the aluminum engine block that the second material layer, and the second material layer has a greater material hardness than the first material layer, is a copper alloy as the first material layer and stainless steel as the second material layer. Therefore, it is the examiner's position that Palazzolo et al. in view of Alkhimov et al., in further view of Shepard, teach coating the cylinder bore with two material layers, with the adhesion of the first material layer to the aluminum engine block greater than the second material layer, and the material hardness of the second material layer greater than the first material layer.

With respect to claim 22, Alkhimov et al. teach that the particle size of the materials deposited is between about 1 and about 50 microns [abstract]. This overlaps both ranges claimed by applicant. In the case where claimed ranges overlap or lie inside ranges disclosed by the prior art, a *prima facie* case of

obviousness exists. Consequently, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to deposit the first and second material utilizing a material size for each between about 1 and about 50 microns, as suggested by Alkhimov et al.

Claims 20, 21, and 23, are rejected under 35 U.S.C. § 103(a) as being unpatentable over Palazzolo et al. {US 5,691,004}, in view of Alkhimov et al. {US 5,302,414}, in view of Shepard {US 2,588,422}, as applied to claim 1 above, in further view of Gorynin et al. {US 5,362,523}.

With respect to claims 20 and 21, Palazzolo et al., in view of Alkhimov et al., in view of Shepard, teach all the limitations of this claim described above, including coating a first material with a lower thermal resistance and wear resistance than a second material [see the rejection of claims 2 – 4].

None of the cited references teach initially coating the cylinder bore with a first material, then with a gradient of the first material and a second material, followed by the second material.

Gorynin et al. teach that stable interfaces between two materials having differences in their physical properties (specifically, thermal expansion coefficients) may be achieved by forming a compositional gradient of the materials [c. 1, ll. 10 – 23]. Specifically, thermal shock that leads to delamination or spalling of coating layers is avoided by coating a film that is initially 100% of a first material and grades through the thickness profile of the deposited layer to 100% of a second material [see Fig. 4]. While Gorynin et al. particularly suggest a metal/metal-oxide graded film, it is clear that such a gradient layer may be advantageously produced from two other materials with different physical properties, such as two metals or alloys.

In the rejection of claims 2 – 4 above, it has been established that Palazzolo et al., in view of Alkhimov et al., in view of Shepard, teach the deposition of first and second materials with different thermal resistance. Consequently, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to deposit a graded layer of first and second materials, as suggested by Gorynin et al. One of ordinary skill in the art would have been motivated to do so by the desire and expectation of preventing delamination and spalling of the coating due to thermal shock.

The examiner notes that Gorynin et al. teach powder plasma thermal spraying of the first and second materials. Again, as noted above, Alkhimov et al. teach the advantages of gas-dynamic cold spraying over powder plasma thermal spraying. It is the examiner's position that modifications necessary to the apparatus of Alkhimov et al., such as those required to provide for controlled, metered mixing of the first and second materials during deposition, would have been well-within the level of skill of one of ordinary skill in the art.

With respect to claim 23, Alkhimov et al. teach that the particle size of the materials deposited is between about 1 and about 50 microns [abstract]. This overlaps both ranges claimed by applicant. In the case where claimed ranges overlap or lie inside ranges disclosed by the prior art, a *prima facie* case of obviousness exists. Consequently, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to deposit the first and second material utilizing a material size for each between about 1 and about 50 microns, as suggested by Alkhimov et al.

VIII. Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William P. Fletcher III whose telephone number is (703) 308-7956. The examiner can normally be reached on Monday through Friday, 9 AM to 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive P. Beck can be reached on (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

William Phillip Fletcher III
Patent Examiner
United States Patent & Trademark Office
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